

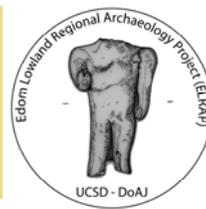
# The Economy of Edom Revisited: Iron Age Copper Extraction Technologies and Resource Management in Faynan, Jordan

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**Jabal al-Jariya pit mine field (placer).** Recently discovered as part of a regional ancient roads survey and has been confirmed by OSL dates to be the largest Iron Age copper mine field in Faynan (see map for location).



**Khirbat al-Jariya, Area A.** Our 2006 excavations indicate smelting activities between the late 12<sup>th</sup> and early 10<sup>th</sup> century BCE. The site was abandoned and did not have 9<sup>th</sup> century remains. The production activities were on a smaller scale than at Khirbat en-Nahas and represent only the less advanced Iron Age technology with smaller installations.



**Advancement in copper smelting technology:** In the late 10<sup>th</sup> century BCE the smelting technology (with small furnaces and small tuyeres, see c and d, back and front respectively) was replaced by a more efficient installations (large furnaces and massive tuyeres, see a and b, back and front respectively) that produced large plates of tapping slag (e) with very little copper content. The advanced technology is represented by the top strata at Khirbat en-Nahas.

## Introduction

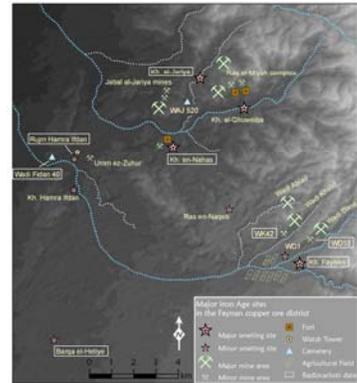
Our research examines the relationship between copper exploitation management, technology and the development of the Iron Age Edomite polity in southern Jordan. The copper extraction in Faynan was recognized as an important Iron Age economic resource already by Knauf and Lenzen (*ICHAJ III*) and others; however, we provide for the first time a detailed and well-established chronological framework for the mining and smelting activities, a refined technological study throughout the Iron Age, and links been the copper exploitation enterprise and social evolution in the southern Levant.



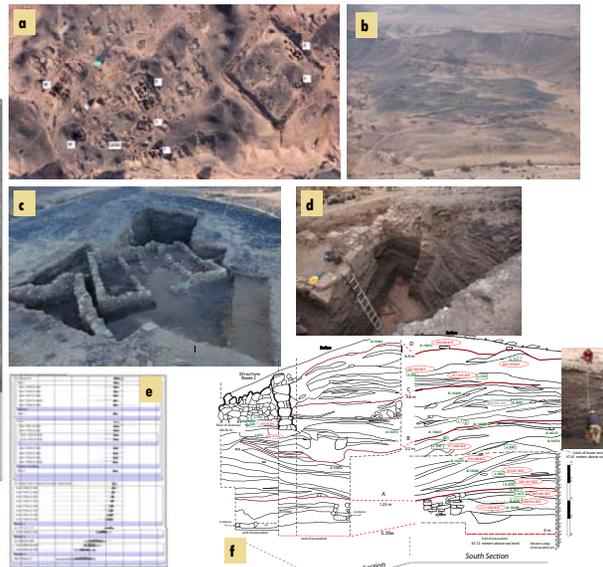
As part of the Edom Lowland Regional Archaeology Project (ELRAP) of UCSD-DoAJ, we conducted excavations and surveys of Iron Age smelting sites (Khirbat en-Nahas, Khirbat al-Jariya, Khirbat al-Ghuweiba) and copper mines (Jabal al-Jariya 1). This research resulted in information concerning new sites as well as a comprehensive assemblage of technological artifacts from well-controlled stratigraphic contexts dated by high resolution 14C measurements.

Research area: Faynan, southern Jordan, the largest copper ore deposit in the southern Levant

## Data – excavations, surveys, and analytical results of technological artifacts



Iron Age sites in Faynan, Jordan: radiocarbon dates indicate copper production activities from the 12<sup>th</sup> to the 9<sup>th</sup> centuries BCE, with the peak in production intensity during the 10<sup>th</sup> – 9<sup>th</sup> centuries.



**Khirbat en-Nahas**, the largest copper smelting site in the southern Levant. (a) and (b) overview of the site and excavation areas; (c) - (f) Area M, excavations into 6 m+ slag mound and associated radiocarbon results. The stratigraphic sequence represent the occupation history of the site, from the 13<sup>th</sup> to the end of the 9<sup>th</sup> centuries BCE; artifacts from the section indicate technological advancement occurring in the late 10<sup>th</sup>/9<sup>th</sup> century BCE.



**Ras al-Miyah East**, a fortress and a mining complex. The mining activities in the Ras al-Miyah Archaeological Complex (see map for location) are dated by abundant pottery sherds to the late Iron Age (8<sup>th</sup> – 6<sup>th</sup> centuries BCE). However, currently there are no smelting sites known from this period in Faynan (except possibly Khirbat Faynan) and the mining operation here may have been unsuccessful, as is the case with the construction of the fortress in the photo: this massive structure was never finished, as demonstrated clearly by the layout of building stones in front of the building (not a collapse) and by the result of the 2006 excavations.



**The archaeometallurgical collection, Levantine Archaeology Laboratory, University of California, San Diego.** Tons of copper production related artifacts (slag, furnace fragments, tuyeres, crucibles, molds, metal products, etc.) are sorted and investigated at the UCSD laboratories, including reconstructions of smelting installations and chemical studies (XRF, below) of the production products. The collection is carefully stored and available for study to all researchers



## Conclusions

Our research in Jordan's Faynan district shows that: (1) Iron Age copper extraction started as early as the 12<sup>th</sup> century and ceased around 800 BCE, except for a (failed?) attempt at Ras al-Miyah in the 8<sup>th</sup> – 6<sup>th</sup> centuries; (2) the peak in copper smelting activities was during the 10<sup>th</sup> and 9<sup>th</sup> centuries BCE; (3) a major break occurred during the second half of the 10<sup>th</sup> century, after which some sites were abandoned and a new and more advanced technology appeared; (4) similar trends in copper exploitation are evident in Timna, Israel; (5) the early copper smelting installations are similar to the Late Bronze Age technology while the advanced technology is a (local?) innovation unique to the Iron Age southern Levant; (6) The copper mines, smelting sites, and manufacture installations represent central control and advanced organization of production already in the 11<sup>th</sup> century BCE and possibly earlier; (7) the 11<sup>th</sup> – 9<sup>th</sup> centuries BCE material culture assemblages associated with the copper exploitation sites (mostly pottery) has “pre-Edomite” attributes suggesting that Faynan was the original core area of the Edomite polity that moved to Busayrah after the copper exploitation ceased; there is no significant evidence of Egyptian control during the Iron Age or earlier.

*The Iron Age copper production in Faynan developed by the local population and coincided with the emergence of the Edomite kingdom/state; a late 10<sup>th</sup> century disruption of the production activities may be attributed to the Egyptian military campaign of Shoshenq I. The origin of the late 10<sup>th</sup> / 9<sup>th</sup> century technological advancement and the end of copper production around 800 BCE are still to be explained.*

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